MAX222xxN
Rev. A

RELIABILITY REPORT

FOR

MAX222xxN

PLASTIC ENCAPSULATED DEVICES

November 7, 2001

MAXIM INTEGRATED PRODUCTS

120 SAN GABRIEL DR.

SUNNYVALE, CA 94086

Written by

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Conclusion

The MAX222 successfully meets the quality and reliability standards required of all Maxim products. In addition, Maxim's continuous reliability monitoring program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards.

Table of Contents

I. Device Description

A. General

The MAX222 line driver/receiver is intended for all EIA/TIA-232E and V.28/V.24 communications, interfaces, and in particular, for those applications where ±12V is not available.

This part is particularly useful in battery-powered systems since its low-power shutdown mode reduces power dissipation to less than 5μW.

B. Absolute Maximum Ratings

Item	Rating
Supply Voltage (V_{CC})	-0.3V to +6V
Input Voltages	
T_{IN}	-0.3V to (V_{CC} - 0.3V)
R_{IN}	±30V
T_{OUT} (Note 1)	±15V
Output Voltages	
T_{OUT}	±15V
R_{OUT}	-0.3V to (V_{CC} +0.3V)
Driver/Receiver Output Short-Circuited to GND	Continuous
Storage Temp.	-65°C to +160°C
Lead Temp. (10 sec.)	+300°C
Power Dissipation	
18-Pin W SO	762mW
18-Pin DIP	889mW
Derates above +70°C	
18-Pin WSO	9.52mW/°C
18-Pin DIP	11.11mW/°C

Note 1: Input voltage measured with T_{OUT} in high-impedance state, /SHDN or V_{CC} = 0V.

II. Manufacturing Information

A. Description/Function:	+5V-Powered, Multi-Channel RS-232 Driver/Receiver
B. Process:	SG5 (Standard 5 micron silicon gate CMOS)
C. Number of Device Transistors:	228
D. Fabrication Location:	California, USA
E. Assembly Location:	Philippines, Malaysia, or Thailand
F. Date of Initial Production:	December, 1996

III. Packaging Information

A. Package Type:	18-Lead WSO	18-Lead DIP
B. Lead Frame:	Copper	Copper
C. Lead Finish:	Solder Plate	Solder Plate
D. Die Attach:	Silver-filled Epoxy	Silver-filled Epoxy
E. Bondwire:	Gold (1.3 mil dia.)	Gold (1.3mil dia.)
F. Mold Material:	Epoxy with silica filler	Epoxy with silica filler
G. Assembly Diagram:	# 05-0701-0622	#05-0701-0623
H. Flammability Rating:	Class UL94-V0	Class UL94-V0
I. Classification of Moisture Sensitivity per JEDEC standard JESD22-A112:	Level 1	Level 1

IV. Die Information

A. Dimensions:	70x109 mils
B. Passivation:	SiN/SiO (nitride/oxide)
C. Interconnect:	Aluminum/Si (Si = 1%)
D. Backside Metallization:	None
E. Minimum Metal Width:	5 microns (as drawn)
F. Minimum Metal Spacing:	5 microns (as drawn)
G. Bondpad Dimensions:	5 mil. Sq.
H. Isolation Dielectric:	SiO_2
I. Die Separation Method:	Wafer Saw

V. Quality Assurance Information

A. Quality Assurance Contacts: Jim Pedicord (Reliability Lab Manager)
Bryan Preeshl (Executive Director**)**
Kenneth Huening (Vice President)

B. Outgoing Inspection Level: 0.1% for all electrical parameters guaranteed by the Datasheet.
0.1% For all Visual Defects.

C. Observed Outgoing Defect Rate: < 50 ppm

D. Sampling Plan: Mil-Std-105D

VI. Reliability Evaluation

A. Accelerated Life Test

The results of the 135°C biased (static) life test are shown in **Table 1**. Using these results, the Failure Rate (λ) is calculated as follows:

$$\lambda = \frac{1}{MTTF} = \frac{6.21}{192 \times 4389 \times 400 \times 2}$$ (Chi square value for MTTF upper limit)

4389 → Temperature Acceleration factor assuming an activation energy of 0.8eV

$\lambda = 9.21 \times 10^{-9}$

λ = 9.21 F.I.T. (60% confidence level @ 25°C)

This low failure rate represents data collected from Maxim's reliability monitor program. In addition to routine production Burn-In, Maxim pulls a sample from every fabrication process three times per week and subjects it to an extended Burn-In prior to shipment to ensure its reliability. The reliability control level for each lot to be shipped as standard product is 59 F.I.T. at a 60% confidence level, which equates to 3 failures in an 80 piece sample. Maxim performs failure analysis on any lot that exceeds this reliability control level. Attached Burn-In Schematic (Spec. # 06-0849) shows the static Burn-In circuit. Maxim also performs quarterly 1000 hour life test monitors. This data is published in the Product Reliability Report (**RR-1I**).

B. Moisture Resistance Tests

Maxim pulls pressure pot samples from every assembly process three times per week. Each lot sample must meet an LTPD = 20 or less before shipment as standard product. Additionally, the industry standard 85°C/85%RH testing is done per generic device/package family once a quarter.

C. E.S.D. and Latch-Up Testing

The PS20-4 die type has been found to have all pins able to withstand a transient pulse of ± 1000V, per Mil-Std-883 Method 3015 (reference attached ESD Test Circuit). Latch-Up testing has shown that this device withstands a current of ±250mA and/or ±20V.

Table 1
Reliability Evaluation Test Results
MAX222xxN

TEST ITEM	TEST CONDITION	FAILURE IDENTIFICATION	PACKAGE	SAMPLE SIZE	NUMBER OF FAILURES
Static Life Test (Note 1)					
	Ta = 135°C Biased Time = 192 hrs.	DC Parameters & functionality		400	2
Moisture Testing					
Pressure Pot	Ta = 121°C P = 15 psi. RH= 100% Time = 96hrs.	DC Parameters & functionality	NSO DIP	240 77	0 0
85/85	Ta = 85°C RH = 85% Biased Time = 1000hrs.	DC Parameters & functionality		77	0
Mechanical Stress					
Temperature Cycle	-65°C/150°C 1000 Cycles Method 1010	DC Parameters		77	0

Note 1: Life Test Data may represent plastic D.I.P. qualification lots.
Note 2: Generic Package/Process data

Attachment #1

TABLE II. Pin combination to be tested. 1/ 2/

	Terminal A (Each pin individually connected to terminal A with the other floating)	Terminal B (The common combination of all like-named pins connected to terminal B)
1.	All pins except V_{PS1} 3/	All V_{PS1} pins
2.	All input and output pins	All other input-output pins

1/ Table II is restated in narrative form in 3.4 below.
2/ No connects are not to be tested.
3/ Repeat pin combination I for each named Power supply and for ground

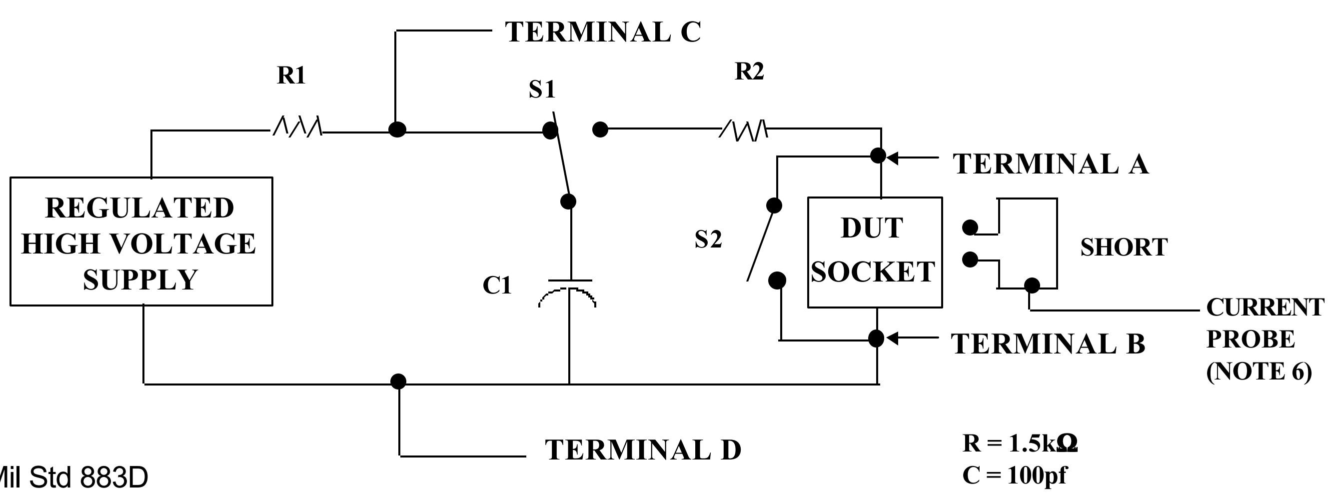
(e.g., where V_{PS1} is V_{DD}, V_{CC}, V_{SS}, V_{BB}, GND, $+V_{S}$, $-V_{S}$, V_{REF}, etc).

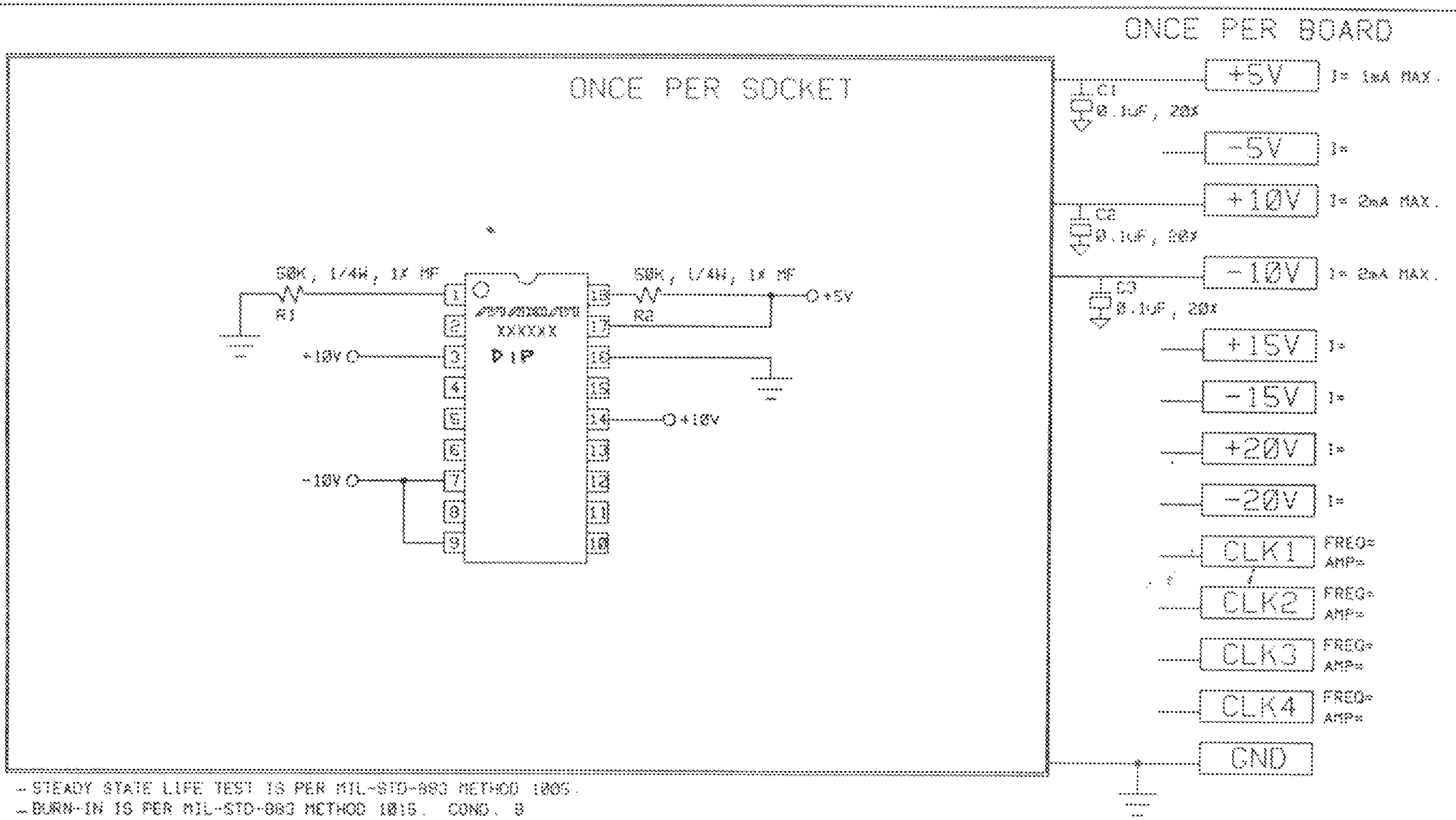
3.4 Pin combinations to be tested.

a. Each pin individually connected to terminal A with respect to the device ground pin(s) connected to terminal B. All pins except the one being tested and the ground pin(s) shall be open.

b. Each pin individually connected to terminal A with respect to each different set of a combination of all named power supply pins (e.g., V_{SS1}, or V_{SS2} or V_{SS3} or V_{CC1}, or V_{CC2}) connected to terminal B. All pins except the one being tested and the power supply pin or set of pins shall be open.

c. Each input and each output individually connected to terminal A with respect to a combination of all the other input and output pins connected to terminal B. All pins except the input or output pin being tested and the combination of all the other input and output pins shall be open.



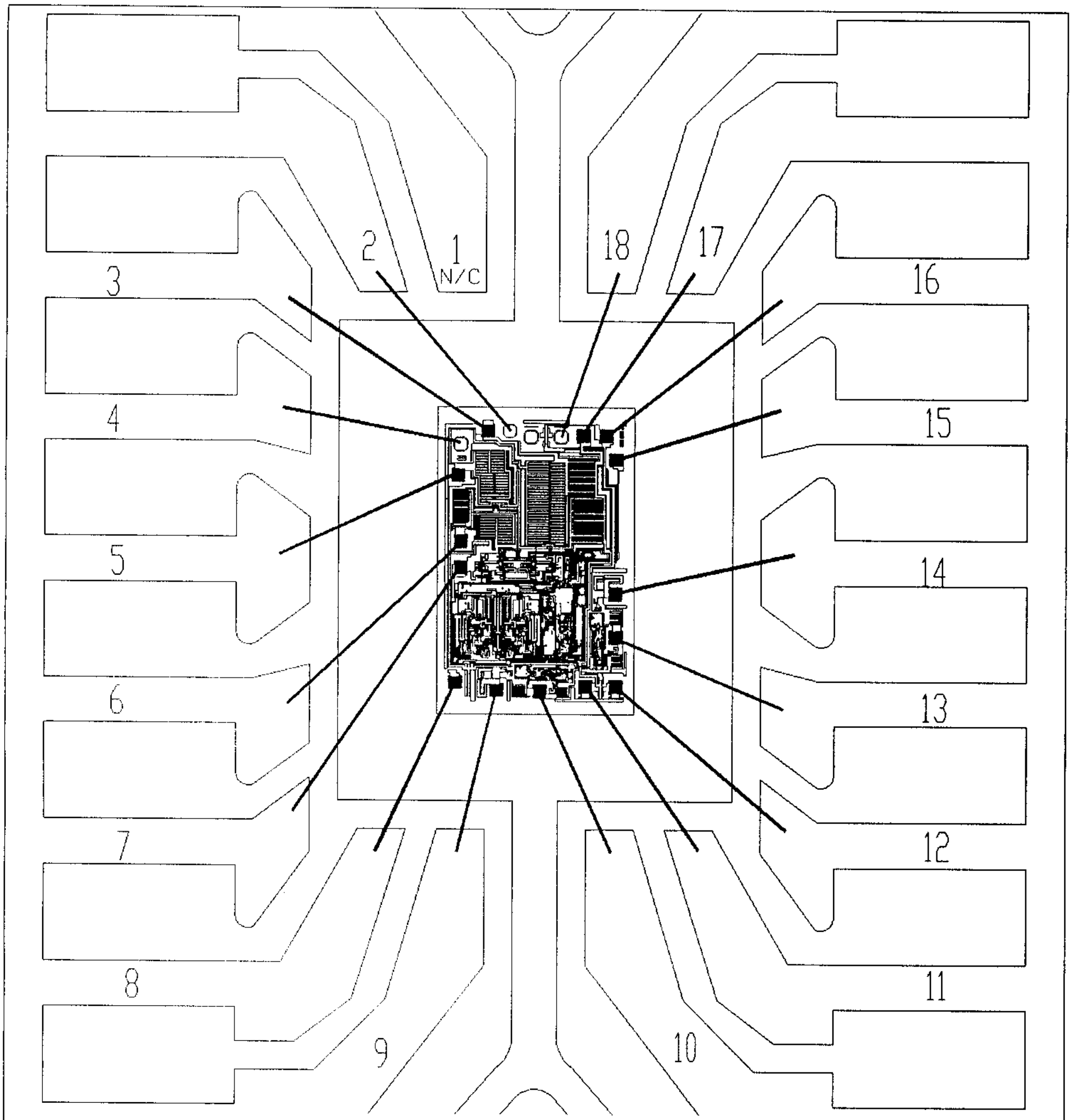


– STEADY STATE LIFE TEST IS PER MIL-STD-883 METHOD 1005.
– BURN-IN IS PER MIL-STD-883 METHOD 1015. COND. B

NOTES:

1. TEMPERATURE: 125C OR EQUIVALENT
2. TIME: 160 HOURS MIN. OR EQUIVALENT
3. ALL COMPONENTS AND MATERIAL MUST STAND 150C CONTINUOUS
4. APPROVED FOR [X] COMMERCIAL
   [X] HR/883

SPEC. NO. 06-849 REV. C	MAXIM BURN-IN SCHEMATIC
DATE: 5/15/92	DEVICE TYPE: MAX222/42
DRAWN BY: N.K. NGUYEN	



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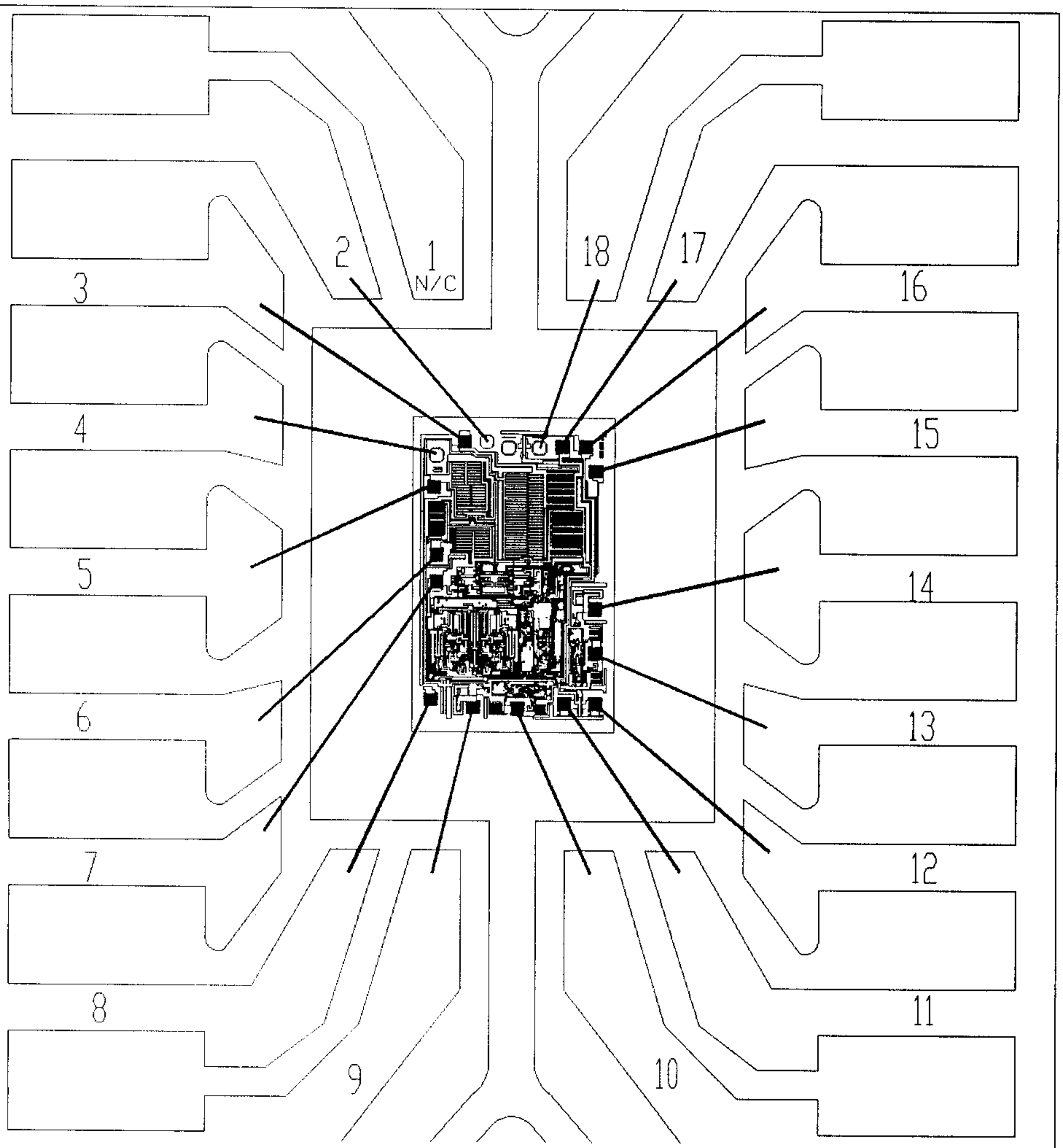

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